Dietary Supplement Use by Older Adults with Chronic Venous Leg Ulcers

Presented in Partial Fulfillment of the Requirements for the Undergraduate Honors with Research Distinction in the College of Nursing

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Abstract

Approximately 49% of all U.S. adults consume one or more dietary supplements daily. One concern about this finding is that some supplements interact negatively with certain medications. For example, vitamin E combined with aspirin can decrease platelet function and increase risk for bleeding. Older adults who are using dietary supplements are likely at increased risk of dangerous supplement/medication interactions because they often have several chronic diseases requiring multiple medications. However, little is known about supplement use in this population. This study's purpose was to describe supplement use in a sample of older adults with chronic venous leg ulcers (CVLUs), chronic conditions associated with aging that have rising prevalence rates. The Theory of Reasoned Action and Theory of Planned Behavior guided this study. It posits that behavior, such as the decision to use dietary supplements to improve health, is influenced by personal beliefs, social pressure, and personal control. This study used a secondary analysis of data derived from 40 older adults with CVLUs participating in the parent study conducted at a large Midwest university research center. All participants completed a sociodemographic questionnaire and a questionnaire containing 13 questions specifically about dietary supplements at baseline. Descriptive statistics were used to characterize the data. Twenty-five of the 40 participants (62.5%) reported taking at least one dietary supplement daily. The mean age of supplement users was 65.16 years (*SD* = 8.51). The majority of supplement users were men (64.0%), Caucasian (68.0%), and had at least some college education (72.0%). Fifteen (60.0%) reported taking 1-2 supplements/day, and 10 (40.0%) reported taking ≥ 3/day. The most common supplements used were multivitamin-mineral complex (48.0%), vitamin D (32.0%) and vitamin B complex (28.0%). Primary reasons for using supplements were 1) physician's recommendation (56.0%), and 2) general health purposes (44.0%). Supplement users reported

taking an average of 9.12 (*SD* = 6.46) prescription drugs and 21 (84.0%) reported ≥ 2 chronic conditions (excluding CVLUs). In summary, more than half of the older adults in this study reported consuming one or more dietary supplements per day. Furthermore, supplement users had multiple chronic conditions and were taking numerous prescription drugs (2-23 per day). Given the significant risk of negative interactions, it is critical that nurses and other healthcare providers ask patients about supplement use and provide evidence-based information about potential interactions. Future studies are needed using larger, more diverse samples of older adults to clarify the extent of supplement use in this population.

Chapter I: Statement of the Problem

Introduction

According to the *Dietary Supplement Health and Education Act of 1994,* a dietary supplement is defined as a product that 1) is intended to supplement the diet, 2) contains ≥ 1 dietary ingredients (e.g., vitamins, herbs), 3) is intended to be taken by mouth, and 4) is labeled as a dietary supplement (1994*).* Currently, an estimated 49% of U.S. adults (≥ 20 years of age) report taking one or more dietary supplements daily (Bailey et al., 2013). Dietary supplement use may be even more common among older adults, but less is known about this population segment (Bailey et al., 2013). While dietary supplements may have health benefits, some can cause adverse effects when used concomitantly with certain medications (Nahin et al., 2009; Farina, Austin, and Lieberman, 2014; Qato et al., 2016). Older adults are at an increased risk for these negative interactions because they often take multiple medications for multiple chronic conditions.

Background of the Problem

Dietary supplement use is on the rise in the U.S. Currently, nearly half of all U.S. adults report consuming at least one dietary supplement daily (Bailey et al., 2013). In 2011, U.S. adults spent more than $30 billion on dietary supplements and that number is expected to escalate (Bailey et al., 2013). Given that supplement use is rising in the U.S., there is an increased risk for negative drug/supplement interactions, especially for people who use multiple medications. Concurrent use of 5 or more medications or supplements has increased from 53.4% to 67.1% from 2005-2011 in the older adult population (Qato et al., 2016). Some of the more common medications that have the potential to interact negative with dietary supplements include nonsteroidal anti-inflammatory drugs (NSAIDs), thyroid drugs, and estrogens (Nahin et al.,

2009). The risk of adverse interactions between dietary supplement and medications increases for older adults because they often require multiple medications for multiple chronic conditions. (Qato et al., 2016). However, while many studies have evaluated dietary supplement use among the general U.S. adult population, few studies have focused specifically on older adults. Therefore, less is known about the extent of dietary supplement use in this population segment or why older adults choose to use dietary supplements.

Purpose of the Study

The purpose of the study is to describe dietary supplement use in a sample of older adults with at least one chronic condition, chronic venous leg ulcers (CVLUs).

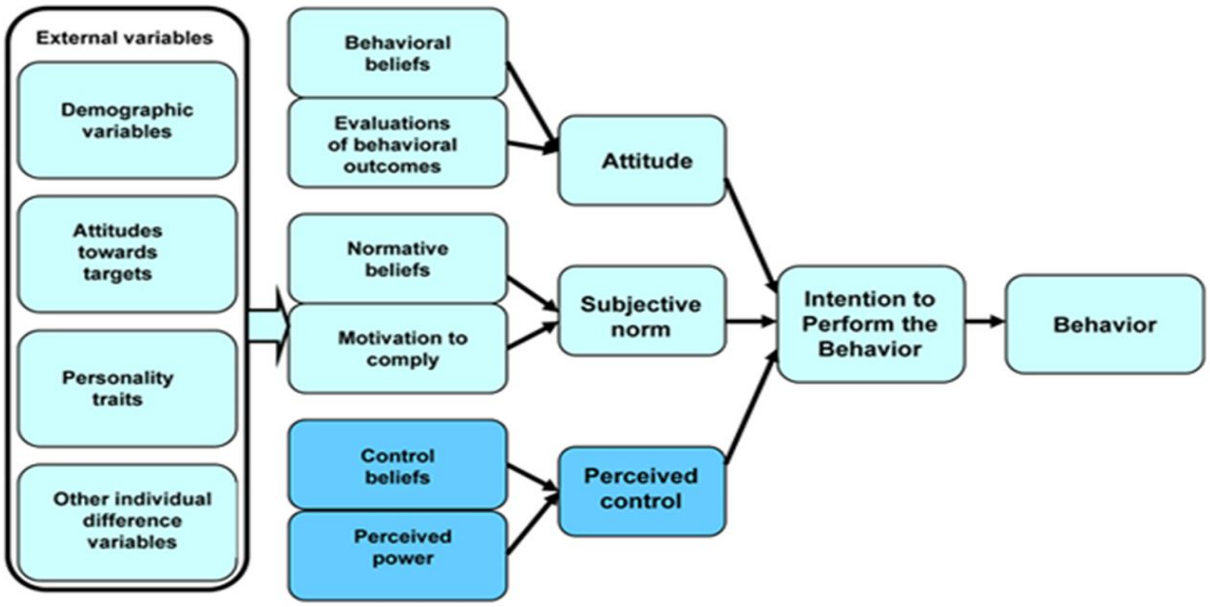
Significance of the Study

Although some previous studies have described dietary supplement use in the general U.S. population, very few have characterized supplement use specifically in older adults with chronic conditions. Because older adults frequently have multiple chronic conditions that require several prescription medications, it is important to learn more about dietary supplement use in this population so that more effective assessment and educational strategies can be implemented to reduce risk for adverse medication/supplement interactions. Therefore, the purpose of this study of a sample of older adults with CVLUs was to 1) determine the frequency of dietary supplement use, 2) compare the sociodemographic characteristics between users and nonusers, and 3) describe the reasons given for supplement use, how much is spent on dietary supplements, and where information about dietary supplements is obtained.

Conceptual Frame of Reference

The Theory of Reasoned Action and Theory of Planned Behavior guided the development of the study's aims. It posits that behavior, such as the decision to use dietary supplements to improve health is influenced by personal beliefs, social pressure, and personal control (Figures of TRA/TBP).

Figure 1. The Theory of Reasoned Action and Theory of Planned Behavior



Note: Upper light area shows the Theory of Reasoned Action; entire figure shows the Theory of Planned Behavior

Specific Aims:

1. To describe the frequency of dietary supplement use in a sample of older adults with chronic conditions.
2. To compare sociodemographic data between the dietary supplement users and nonusers.
3. To describe supplement use by the users.
4. To explore factors influencing decisions about dietary supplement use.

Chapter II: Review of Literature

Introduction

Dietary supplements are substances that individuals use to decrease the risk of a disease or simply to add nutrients to their diets (Dietary Supplements, 2013). Dietary supplements include minerals, vitamins, fiber, herbs, plants, enzymes, and amino acids. Many studies have been conducted in the last ten years describing the prevalence of dietary supplement use in the U.S., but very few studies have focused specifically on older adults with chronic conditions such as CVLUs, a type of chronic wound with rising prevalence rates that is associated with aging. Although many dietary supplements are harmless and may actually prove beneficial for wound healing and general health, others can lead to adverse health consequences, especially in older adults with weakened immune systems and multiple comorbidities, and when consumed concomitantly with prescription medications (Farina, Austin, and Lieberman, 2014). Thus it is important to explore the beliefs and practices of supplement use by older adults.

Supplement use in the U.S. adult population

The National Health and Nutrition Examination Survey (NHANES) is a cross-sectional, population-based survey used to characterize various health-related data from people in the U.S. including dietary supplement use (Bailey et al., 2013). From NHANES data, researchers have determined that in the U.S., dietary supplements use has steadily increased over time since the 1970s (Bailey et al., 2010). In the 2007-2010 NHANES survey, nearly half of adults reported using one or more supplements each day (Bailey et al., 2013). Additionally, there are rising costs associated with the increased use of supplements. In 2011, Americans spent more than $30 billion on dietary supplements (Bailey et al., 2013). Although, not as much is known about supplement use in the older adult population (≥ 55 years of age) as in the younger adult segment,

the NHANES 2007-2011 study did report that 67.4 % of adults aged 60 years or older reported some dietary supplement use (Bailey et al., 2013).

Some studies suggest that older adults may be more likely to take dietary supplements than younger adults because they are aware they often do not consume adequate levels of key nutrients through the foods they eat and that their ability to absorb nutrients from the foods associated is diminished because of the aging process (Sebastian et al., 2007). Further, the types of supplements older adults choose to consume may vary from those younger adults opt to use. It has been reported that among the general population, older adults are more likely to consume chromium, zinc, magnesium, and selenium compared to younger or middle aged adults (Bailey et al., 2010).

Studies have shown that indeed a high percentage of older adults aged 51 years or older do not meet the Estimated Average Requirement (EAR) for one or more of the vitamins and minerals important for health, (e.g., folate, zinc, magnesium, and vitamins A, B-6 and C) through the foods they consume (Sebastian et al., 2007). This increases their susceptibility to nutritional deficits that could lead to chronic diseases and comorbidities such as diabetes or hypertension. Thus some older adults may benefit from the consumption of select dietary supplements, however there is increased risk of serious interactions between some supplements and certain medications that older adults commonly take for chronic conditions (Qato et al, 2016). For example, calcium supplementation can reduce the actions of thyroid hormone replacement drugs and thus lead to a subtherapeutic response (Nahin et al., 2009).

Most common dietary supplements used by U.S. adults/reasons why used

According to the NHANES (2007-2010), the most common dietary supplement used by adults is a multivitamin and the main reasons reported for taking multivitamins are to supplement

diets and to maintain or improve health (Bailey et al. 2013). The second and third most commonly used dietary supplements are calcium and fish oil, respectively.

Men more often than women report taking dietary supplements for heart health or to decrease cholesterol and women more commonly than men report using calcium supplements to improve their bone health (Bailey et al., 2013). Other reasons cited for taking dietary supplements are: to prevent colds or boost immunity, to maintain healthy joints, to enhance energy, to improve skin, bowel, eye, prostate, hair, nail and mental health, for anemia, for weight loss, to improve sleep, to reduce menopause symptoms, and for pregnancy. Interestingly, the survey found that only 23% of supplements are being used because of recommendations by a health care provider (Bailey et al. 2013).

Sebastian et al. (2007) report that older adults are more likely to take supplements to help a specific problem such as the heart, bone and joints, and the eyes. However, many people (including older adults) do not understand the actions of dietary supplements, the importance of taking the supplements daily and the potential dangers from using some dietary supplements concomitantly with certain prescription medications (Qato et al., 2016).

Concomitant dietary supplement and prescription medication usage

The most common prescription medications reported to be used along with dietary supplements are NSAIDS, thyroid drugs, estrogens, and medications to control diabetes mellitus (Nahin et al., 2009). This concomitant use may result in adverse interactions and thus can increase morbidities, particularly for older adults who often take multiple medications for more than one chronic condition. For example, NSAIDs taken with vitamin E increases risk for decreased platelet function and diuretics taken with vitamin D increases the risk for hypercalcemia (Nahin et al., 2009). Additionally, there can be a decreased absorption of

prescription medications or supplements when taken together, which can increase or decrease intended therapeutic effects. For example, certain herbs such as gingko or garlic may alter the effectiveness of certain medications (Nahin et al., 2009).

A study of 3,070 older adults (≥ 75 years of age) conducted at four separate clinical centers throughout the U.S. reported high rates of concomitant use of prescription drugs and dietary supplements (Nahin et al., 2009). During the study, participants brought their prescription drugs and dietary supplements to one of the four clinical centers where the researchers identified the risk for negative interactions. The data revealed that 74.2% of the sample used at least one dietary supplement and prescription medication together. This percentage is much higher than what is reported in the general U.S. population, which is approximately 16%-21% (Nahin et al., 2009).

Another study reported that individuals with physician-diagnosed medical conditions are more likely to take multiple prescription medications and dietary supplements together, increasing the potential for adverse interactions (Farina, Austin, and Lieberman, 2014). Because of this, the study suggested that a doctor-informed medical condition (DIMC) be considered a risk factor for concomitant usage and emphasized how critical it is that health care providers ask about medication and dietary supplement use by patients on a regular basis.

Although the collective studies report that many people are using dietary supplements and prescription medications together and that severe complications can result, there are no specific recommendations to help reduce this problem and no evidence of what the long-term side effects might be, especially for older adults (Qato et al., 2016).

Chronic Diseases in Older Adults – Including Nonhealing Wounds

There is an increased prevalence of multiple chronic diseases in the older adult population such as diabetes and cardiovascular disease that usually require multiple medications for effective management (Qato et al., 2016). Further, these particular diseases increase the risk of another chronic condition often seen in the aging – nonhealing or chronic wounds (Gould et al., 2015). Diabetic foot ulcers, pressure ulcers and CVLUs are the three most common types of chronic wounds occurring in older adults, but of the three, CVLUs are the most common. Treatment related costs for CVLUs are ~$10 billion annually and the older adult population accounts for the majority of this cost (Gould et al., 2015).

The pathogenesis of CVLUs involves venous hypertension and insufficiency of the calf muscle pump that presents as an area of epidermal discontinuity (Van Gent, Wilschut, and Wittens, 2010). Chronic inflammation and malnutrition also contribute to the persistence and recurrence of these wounds. An adequate nutritional intake is critical for wounds to heal efficiently and certain nutrients (e.g., protein, vitamin C, zinc) are more important than others to the healing process.

Zinc is one micronutrient that is essential for wound healing because it is involved in critical functions within the immune system (Wilkinson, 2014). If there is not enough zinc in the body, a person may have reduced immune function and thus be at higher risk for infection and poor wound healing. Although zinc is critical to the wound healing process and deficiencies lead to healing delays, studies testing whether zinc supplementation facilitates healing have reported mixed findings (Wilkinson, 2014). Additionally, although other dietary supplements (e.g., vitamin C) have been found to be useful for chronic wounds in some situations, studies testing supplementation report findings that are highly variable, influenced by covariates such as

comorbidities and prescription medications (Molnar, Underdown, Clark, 2014). It has been found that vitamin D, zinc, and vitamin B12 are the most common micronutrient deficiencies among the older adult population and could have an impact on the time it takes for wounds to heal (Molnar, Underdown, Clark, 2014). Although micronutrients are only needed in small amounts in the body, deficiencies can reduce the body's ability to maintain homeostasis. Although it is known that an adequate consumption of certain key nutrients are essential for efficient wound healing, nutrition is not a topic healthcare providers typically discuss with chronic wound patients and nutritional assessments are not usually a part of standard wound care protocols (Molnar, Underdown, Clark, 2014). Therefore patients with chronic wounds may seek out nutritional information from other sources such as Internet sites when trying to make a decision about whether to use dietary supplements.

Given the high prevalence rate of cardiovascular disease and diabetes in the aging population and their association with CVLUs, it is not surprising that CVLUs also have rising prevalence rates (Gould et al., 2015). Additionally, because CVLUs are painful, require protracted treatments and often recur, it can be hypothesized that older adults with these conditions often pursue alternative therapies such as nutritional supplementation in an attempt to improve healing outcomes and their general health.

Chapter Summary

Overall, some studies have described dietary supplement use by U.S. adults, but few have focused on the older adult population with chronic conditions such as CVLUs, thus it is not clear which supplements are commonly used by this population, why they are used or if their use is shared with the primary healthcare provider. These gaps in the literature need to be addressed

because especially for older adults, there can be dangerous health consequences to consuming some supplements in conjunction with certain prescription medications.

Chapter III: Methodology:

Research Design

This study used a secondary analysis of data from a randomized clinical trial conducted at Ohio State University (OSU) Clinical Research Center (CRC) between 2011 and 2014. The parent study's primary aim was to examine the effects of fish oil supplementation on lipid mediators of inflammation in the microenvironment of older adults with CVLUs. Participants with CVLUs were studied after recruitment, eligibility screening, and informed consent was given.

The current study analyzed data generated by the dietary supplement questionnaire that was completed by all study participants to determine the frequency of dietary supplement usage, the types of supplements used, the motivation behind use, and the possibility of concomitant use with prescription medications. Sociodemographic data were also analyzed.

Population Sample

Data from a sample of 40 men and women (mean age of 67 years) who had at least one existing CVLU for ≥ 3 months living in Central Ohio were analyzed. The parent study identified potential participants over a period of 18 months by reviewing charts from the OSU Comprehensive Wound Center. Once identified, potential participants were given detailed information about the study and screened for eligibility if they expressed interested in participating.

Setting

The parent study was conducted at the OSU CRC after approval by the OSU Institutional Review Board (IRB). It was implemented in accordance with the ethical rules and standards for human experimentation as explained in Declaration of Helsinki.

Instruments

Dietary Supplement questionnaire

To collect data about dietary supplement use, the parent study used an electronic questionnaire validated in previous studies that contained 13 questions specifically asking about dietary supplement use. (Appendix) Participants completed the questionnaire on electronic tablets and the CRC nurses assisted as needed. The questionnaire included questions asking about the types of supplements used, where they were purchased, the cost associated with supplement use, why supplements were used and where information about dietary supplements was obtained. The questionnaire also asked if participant would consider taking a dietary supplement to improve wound healing.

Sociodemographic questionnaire

Participants in the parent study were asked to complete an electronic questionnaire wherein they self-reported sociodemographic data. The questionnaire included questions about gender, age, income ($0 to 4,999; $5,000 to 9,999; $10,000 to 14,999; $15,000 to 19,999; $20,000 to 24,999; $25,000 to 29,999; $30,000 to 34,999; $35,000 to 39,999; $40,000 to 44,999; and $45,000 and up), highest level of education completed (some high school, high school, some college, college or university graduate, and graduate or professional training), marital status, race, employment status, and the number of people in their household. The medication and comorbidity data were collected by a CRC nurse during the initial interview. All electronic data

collected from the study participants were entered into the Research Electronic Data Capture (REDCap) system.

Data Analysis

Descriptive statistics, such as percentages, means, and standard deviations (SD) were used to summarize the dietary supplement data and the sociodemographic data. Student *T*-tests were used to evaluate differences in means of continuous variables between groups (Users/nonusers). The Statistical Package for the Social Sciences version 21.0 was used for data analysis.

Chapter IV: Results

Sociodemographic Questionnaire Results

The secondary analysis compiled data from 40 men and women (mean age of 67 years) living in Central Ohio with at least one CVLU for ≥ 3 months. Of the 40 participants, 25 (62.5%) reported to take one or more dietary supplement daily. The majority of dietary supplement users were men (64.0%), single (52.0%), White (68.0%), not employed or disabled (96.0%), reported having at least some college education (72.0%), and an income of < $30,000/yr. (60.0%). There was no statistical difference in sociodemographic data between dietary supplement users (n=25) and nonusers (n=15).

Table 1. Sociodemographic Characteristics of Sample

	Total CVLU Subjects (n=40)	Dietary supplement users (n=25)	Nonusers (n=15)
Mean age (SD)	67 (11.14)	65.16 (8.51)	55.13(12.14)
Gender, *n* (%)			
Male	25 (62.5%)	16 (64.0%)	9 (60.0%)
Female	15 (37.5%)	9 (36.0%)	6 (40.0%)
Education, *n* (%)			
Some high school	3 (7.5%)	2 (8.0%)	1 (6.7%)
High school graduate	12 (30.0%)	5 (20.0%)	7 (46.7%)
Some College	13 (32.5%)	10 (40.0%)	3 (20.0%)
College Graduate	10 (25.0%)	6 (24.0%)	4 (26.7%)
Graduate Training	2 (5.0%)	2(8.0%)	0
Marital Status, *n* (%)			
Married/living with Partner	18 (45.0%)	12 (48.0%)	6 (40.0%)
Single	22 (55.0%)	13 (52.0%)	9 (60.0%)
Race, *n* (%)			
Black	11 (27.5%)	7 (28.0%)	4 (26.7%)
White	28 (70.0%)	17 (68.0%)	11 (73.3%)
Hispanic/ Latino	1 (2.5%)	1 (4.0%)	0
Employment, *n* (%)			
Employed	5 (12.5%)	1 (4.0%)	4 (26.7%)
Not employed/disabled	35 (95.0%)	24 (96.0%)	11 (73.3%)
Household income, *n* (%)			
<$14,999	20 (50.0%)	12 (48.0%)	8 (53.3%)
$15,000-$29,999	6 (14.0%)	3 (12.0%)	3 (20.0%)
$30,000-$44,999	3 (7.5%)	2 (8.0%)	1 (6.7%)
≥$45,000 and up	11 (27.5%)	8 (32.0%)	3 (20.0%)

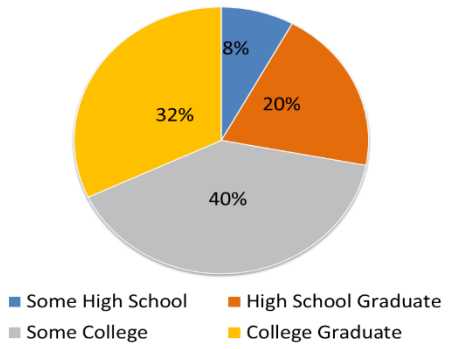


Figure 2A. Level of education of supplement users by %. (n=25).

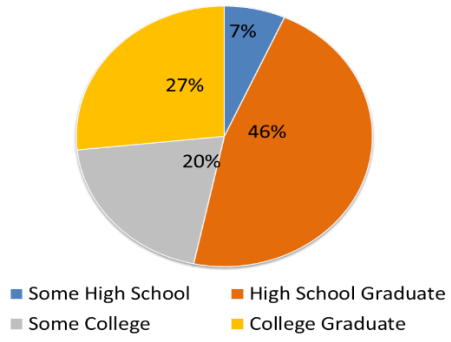


Figure 2B. Level of education of supplement nonusers by % (n=15)

Dietary Supplement Users

Of the dietary 25 dietary supplement users, 16 were men and 9 were women. The users reported various types and amounts of supplements. (Table 2) The most common supplements used were a multivitamin complex (52.0%), vitamin D (32.0%), vitamin B complex (28.0%), and calcium (24.0%). Men were more likely to report using a multivitamin complex (62.5%) and women were more likely to report using calcium (44.4%). Ten of the supplement users (40.0%) reported taking ≥ 3 dietary supplements daily

Table 2. Types and Quantities of Supplements Used by Gender (n=25)

	Total Users (n=25)	**Men (n=16)**	**Women (n=9)**
Type of Supplement, n (%)			
Multivitamin complex	13 (52.0%)	10 (62.5%)	3 (33.3%)
Vitamin D	8 (32.0%)	5 (31.3%)	3 (33.3%)
Vitamin B complex	7 (28.0%)	5 (31.3%)	2 (22.2%)
Calcium	6 (24.0%)	2 (12.5%)	4 (44.4%)
Iron	3 (12.0%)	2 (12.5%)	1 (11.1%)
Vitamin C	2 (8.0%)	1 (6.3%)	1 (11.1%)
Fish oil/ omega-3	2 (8.0%)	1 (6.3%)	1 (11.1%)
Folic acid	2 (8.0%)	1 (6.3%)	1 (11.1%)
Glucosamine/ Chondroitin	2 (8.0%)	2 (12.5%)	0
Vitamin E	2 (8.0%)	1 (6.3%)	1 (11.1%)
Vitamin B12	1 (4.0%)	1 (6.3%)	0
Biotin	1 (4.0%)	0	1 (11.1%)
Ocuvite	1 (4.0%)	0	1 (11.1%)
Alpha Lipolic	1 (4.0%)	0	1 (11.1%)
B-6 Pyridoxine	1 (4.0%)	1 (6.3%)	0
Potassium Chloride	1 (4.0%)	1 (6.3%)	0
Quantity of Supplements, n (%)			
1-2 daily	15 (60.0%)	9 (65.3%)	6 (66.7%)
3-4 daily	9 (36.0%)	7 (43.8%)	2 (22.2%)
More than 4 daily	1 (4.0%)	0	1 (11.1%)
Length of time taking supplements, n (%)			
Less than 1 year	5 (20.0%)	4 (25.0%)	1 (11.1%)
Between 1-5 years	15 (60.0%)	8 (50.0%)	7 (77.8%)
More than 5 years	5 (20.0%)	4 (25.0%)	1 (11.1%)

The most common reasons reported for using a dietary supplement were because of a physician's recommendation (56.0%) and for general health purposes (44.0%).

Table 3. Reasons for Using Dietary Supplements by Gender

Reason	Total Users (n=25)	Men (n=16)	Women (n=9)
Physician's recommendation	14 (56.0%)	10 (62.5%)	4 (44.4%)
General health purposes	11 (44.0%)	7 (43.8%)	4 (44.4%)
Improve bone density	3 (12.0%)	0	3 (33.3%)
Boost the immune system	3 (12.0%)	2 (12.5%)	1 (11.1%)
Increase energy	2 (8.0%)	2 (12.5%)	0
Arthritis	1 (4.0%)	1 (6.3%)	0
Joint Pain	1 (4.0%)	1 (6.3%)	0
Age	1 (4.0%)	0	1 (11.1%)
Anemia	1 (4.0%)	0	1 (11.1%)
Vision	1 (4.0%)	1 (6.3%)	0
Wound Healing	1 (4.0%)	1 (6.3%)	0

Although the majority of the users stated they obtained information about supplement use from their primary physician (64.0%), there were still many who reported less reliable sources such as books, magazines, and TV (24.0%) as well as the Internet (8.0%). The majority obtained the supplements from a grocery store (56.0%) and spent less than $50 per month (84.0%).

Table 4. Miscellaneous Information about Supplement Usage by Gender

	Total Users (n=25)	Men (n=16)	Women (n=9)
Place obtained, n (%)			
Grocery Store	14 (56.0%)	9 (56.3%)	5 (55.6%)
Drugstore	12 (48.0%)	6 (37.5%)	6 (66.7%)
Internet site	2 (8.0%)	2 (12.5%)	0
Nursing home	2 (8.0%)	1 (6.3%)	1 (11.1%)
Source, n (%)			
Primary physician	16 (64.0%)	10 (62.5%)	6 (66.7%)
Books, magazines, TV	6 (24.0%)	5 (31.3%)	1 (11.1%)
Friends/ family members	5 (20.0%)	2 (12/5%)	3 (33.3%)
Internet	2 (8.0%)	2 (12.5%)	0
Women's Health Initiative (WHI)	1 (4.0%)	0	1 (11.1%)
Cost (per month), n (%)			
Less than $50	21 (84.0%)	12 (75.0%)	9 (100%)
$50-$100	3 (12.0%)	3 (18.8%)	0
Unanswered	1 (4.0%)	1 (6.3%)	0

Medication and Comorbidity Review

The dietary supplement users reported numerous comorbidities and daily prescription medications. (Table 5) Fifteen of the users (60.0%) reported three or more comorbidities with the most common comorbidities being arthritis (56.0%), diabetes (56.0%), and depression (28.0%). All of the supplement users reported taking ≥ 2 prescription medications per day, and 80% (20/25) reporting taking ≥ 4 prescription medications per day.

Table 5. Comorbidities and Prescription Medications Reported by Supplement Users

	Total Users (n=25)	**Men (n=16)**	**Women (n=9)**
Number of Comorbidities, n (%)			
0-2	10 (40.0%)	6 (37.5%)	4 (44.4%)
3-4	10 (40.0%)	8 (50.0%)	2 (22.2%)
5 or more	5 (20.0%)	2 (12.5%)	3 (33.3%)
Type of Comorbidities, n (%)			
Arthritis	14 (56.0%)	8 (50.0%)	6 (66.7%)
Diabetes	14 (56.0%)	11 (68.8%)	3 (33.3%)
Depression	7 (28.0%)	3 (18.8%)	4 (44.4%)
Cardiac Disorder	4 (16.0%)	3 (18.8%)	1 (11.1%)
Amount of Prescription Medications, n (%)			
0-3	5 (20.0%)	3 (18.8%)	2 (22.2%)
4-8	9 (36.0%)	6 (37.5%)	3 (33.3%)
9 or more	11 (44.0%)	7 (43.8%)	4 (44.4%)

Chapter V: Conclusions and Recommendations

The purpose of this study was to describe dietary supplement use by a sample of older adults with chronic conditions (CVLUs) and assess factors affecting decisions to use dietary supplements. The study found that all of the participants reported they would consider taking a dietary supplement specifically to improve wound healing. We report that over half (62.5%) of the current study sample reported using dietary supplements. This frequency finding is similar to

that of NHANES 2007-2011, which found that 67.5% of older adults (aged 60 years or older) reported taking at least one dietary supplement daily (Bailey et al., 2013).

There were no statistical differences between the sociodemographic data between dietary supplement users and nonusers in the current study, but the majority of supplement users reported a higher level of education when compared to nonusers. However, even though over 70% of supplement users reported having some college or being a college graduate, the majority (60%) reported an annual household income of <$30,000. In the NHANES 2007-2010, dietary supplement users also reported higher levels of education versus nonusers (Bailey et al., 2013). However, dietary supplement users in the general U.S. adult population reported having a higher socioeconomic status (determined by annual income) compared to nonusers, which was not the case in this study.

Of the 25 supplement users in the current study, 40% reported using multiple dietary supplements each day (three or more) and having multiple chronic conditions. Additionally, 80% reported taking ≥ 4 prescription medications daily, which increases their chances of dangerous supplement/drug interactions (Qato et al., 2016). Past studies that have looked at potential negative drug/ supplement interactions have found that this concurrent use is on the rise; the use of five or more medications or supplements increased from 53.4% to 67.1% from 2005 to 2011 (Qato et al., 2016). A multivitamin complex (MVC) was the most common supplement used by the current study sample, followed by vitamin D, vitamin B complex, and calcium. NHANES 2007-2010 also reported that the U.S. adult population was using MVCs most frequently, followed by calcium, fish oil, and botanical supplements (Bailey et al., 2013).

While MVCs are commonly used and often thought to be harmless, a potential problem is that they often contain vitamins K and E, which can alter the effectiveness of drugs to reduce

blood clotting (Nahin et al., 2009.) In the study completed by Nahin et al. (2009) the researchers found that a MVC was used by more than 50% of their sample and had the potential to interact negatively with NSAIDs such as aspirin.

The most common reasons given for supplement use by the older adults in the current study were because of a physician's recommendation (56%) and for general health purposes (44%), which are somewhat different from reasons for supplement use reported in the NHANES 2007-2011 for all adults (Bailey et al., 2013). NHANES found that the main reason reported for supplement use was to improve health and that only 23% on the U.S. adult population reported taking supplements as a result of a recommendation from a healthcare provider (Bailey et al., 2013). Although the wording was slightly different between the surveys (physician vs. healthcare provider), these disparities suggest that factors influencing older adults' decisions to use dietary supplements are different from those impacting decisions of younger adults.

This study also evaluated potential difference is supplement use between men and women. A MVC was the most frequently used supplement by men in the sample, while calcium was the most frequently used supplement by women. Although reasons for supplement use were similar among men and women, women reported that a primarily reason for consuming supplements was to improve bone density whereas men reported using supplements to boost the immune system and increase energy. Similarly, the NHANES 2007-2010 found that both men and women use a MVC more frequently than any other supplement (Bailey et al., 2013). However, the second most prevalent supplement among women was reported to be calcium. The NHANES reported that men most often report taking dietary supplements for heart health or for decreasing cholesterol while women more commonly report using calcium products to improve bone health. Thus findings from the current study regarding the types of supplements used by

older men and women and their reasons for using supplements are somewhat similar to findings from the NHANES study of all adults.

Limitations

This study's sample size was relatively small, not racially-diverse, and representative of only one area of Ohio, which reduces the generalizability of the findings. Other limitations are that the data were self-reported and that the dietary supplement questionnaire did not include all possible dietary supplements in the answer choices. Although there was an open-ended question about the types of supplements used, the participants may not have known that what they were using was considered a dietary supplement. Additionally, the questionnaire did not ask about negative supplement/medication interactions that may have occurred in the past.

Implications for future practice

Given the risk for negative supplement/drug interactions, it is critical that healthcare providers assess for supplement use by all patients and provide evidence-based information about dietary supplements. These strategies may reduce the risk for adverse events that can occur when some supplements are taken concomitantly with certain medications, particularly in populations more vulnerable than others because of comorbidities and weakened immune systems (i.e. older adults with chronic conditions).

Recommendations

Future studies using larger, more diverse older adult samples may clarify the extent of supplement use in the older adult population. Qualitative studies using The Theory of Reasoned Action and Theory of Planned Behavior are needed to clarify factors influencing decisions to use dietary supplements. Finally, studies are needed that describe the frequency and type of adverse prescription medication/dietary supplement interactions in older adults.

References

Bailey, R. L.k, Gahche, J. J., Lentino, C. V., Dwyer, J. T., Engel, J. S., Thomas, P. R., … & Picciano, M. F. (2010). Dietary supplement use in the United States, 2003–2006. *The Journal of nutrition*, jn-110

Bailey, R. L., Gahche, J. J., Miller, P. E., Thomas, P. R., & Dwyer, J. (2013). Why US adults use dietary supplements**.** *JAMA Intern Med*, *173*(5), 355-361.

Bauer, J., D., Isenring, E., & Waterhouse, M. (2013). The effectiveness of a randomized oral nutrition supplement on outcomes in patients with chronic wounds: A pragmatic randomized study. *Journal of Human Nutrition & Dietetics*, *26*(5), 452-458.

Dickinson, A., Blatman, J., El-Dash, N., & Franco, J. C. (2014). Consumer usage and reasons for using dietary supplements: report of a series of surveys. *Journal of the American College of Nutrition*, *33*(2), 176-182.

"Dietary Supplements." *National Institute on Aging*. NIH, (2013). <https://www.nia.nih.gov/health/publication/dietary-supplements>.

Farina, E., K., Austin, K., G., & Lieberman, H., R. (2014). Concomitant dietary supplement and prescription medication use is prevalent among US adults with doctor-informed medical conditions. *Journal of the Academy of Nutrition & Dietetics*, *114*(11), 1784-1790.e2.

Figures of TRA/TBP. (n.d.). Retrieved March 19, 2017, from https://www.med.upenn.edu/hbhe4/part2-ch4-figures_of_TRA-TPB.shtml.

Gould, L., Abadir, P., Brem, H., Carter, M., Conner-Kerr, T., Davidson, J., … & Grice, E. (2015). Chronic wound repair and healing in older adults: current status and future research. *Wound Repair and Regeneration*, *23*(1), 1-13.

Hankin, C. S., Knispel, J., Lopes, M., Bronstone, A., & Maus, E. (2012). Clinical and cost efficacy of advanced wound care matrices for venous ulcers. *Journal of Managed Care Pharmacy*, *18*(5), 375-384.

Molnar, J. A., Underdown, M. J., & and Clark, W. A. (2014). Nutrition and chronic wounds. *Advances in Wound Care*, *3*(11), 663-681.

Nahin, R. L., Pecha, M., Welmerink, D. B., Sink, K., DeKosky, S. T., & Fitzpatrick, A. L. (2009). Concomitant use of prescription drugs and dietary supplements in ambulatory elderly people. *Journal of the American Geriatrics Society, 57*(7), 1197-1205.

Qato, D. M., Wilder, J., Schumm, L. P., Gillet, V., & Alexander, G. C. (2016). Changes in prescription and over-the-counter medication and dietary supplement use among older adults in the United States, 2005 vs 2011. *JAMA internal medicine, 176*(4), 473-482.

Sebastian, R. S., Cleveland, L. E., Goldman, J. D., & Moshfegh, A. J. (2007). Older adults who use Vitamin/Mineral supplements differ from nonusers in nutrient intake adequacy and dietary attitudes. *Journal of the American Dietetic Association, 107*(8), 1322-1332.

United States., Congress., Senate. (1994). *Dietary Supplement Health and Education Act of 1994*. Retrieved from https://nccih.nih.gov/health/supplements.

Van Gent, W. B., Wilschut, E. D., & Wittens, C. (2010). Management of venous ulcer disease. *BMJ*, *341*(7782), 1092-6.

Wilkinson, E. A., & Hawke, C. C. (2014). Oral zinc for arterial and venous leg ulcers. *The Cochrane Library*.

Appendix

Date: ☐☐ / ☐☐ / ☐☐

DIETARY SUPPLEMENTS: vitamins, minerals, herbs, amino acids, protein blends, enzymes, fatty acids and probiotics.

Do you take any dietary supplements including vitamins, minerals, herbs or other hormonal supplements purchased without a prescription? ○ Yes ○ No

If yes, please continue. If no, you are finished with this form.

What is the name of the dietary supplement(s) you take? Mark all that apply.

- ○ Black cohosh
- ○ Calcium
- ○ Coenzyme Q10
- ○ Dehydroepiandrosterone (DHEA)
- ○ Echinacea
- ○ Essential fatty acids
- ○ Evening primrose
- ○ Fish oil/omega-3
- ○ Flaxseed oil/pills
- ○ Folic Acid
- ○ Garlic
- ○ Ginger
- ○ Ginkgo
- ○ Ginseng
- ○ Glucosamine and Chondroitin
- ○ Green tea
- ○ Iron
- ○ Magnesium
- ○ Melatonin
- ○ Milk thistle
- ○ Multivitamin-mineral complex
- ○ Saw palmetto
- ○ St. John's wort
- ○ Vitamin B complex
- ○ Vitamin C
- ○ Vitamin D
- ○ Zinc
- ○ Other, please specify: ☐☐☐

What is reason/condition for which you take the product(s)? Mark all that apply.

- ○ Physician's recommendation
- ○ Anxiety
- ○ Arthritis
- ○ Back pain
- ○ Boost immune system
- ○ Cholesterol
- ○ Depression
- ○ General health purposes
- ○ Improve bone density
- ○ Improve memory
- ○ Increase energy
- ○ Joint pain
- ○ Neck pain
- ○ Other, please specify:

Do you experience any adverse effects from the product(s)? ○ Yes ○ No

If yes, what are the adverse effects you experience?

Supplement:

Adverse Effect:

Supplement:

Adverse Effect:

Supplement:

Adverse Effect:

Supplement:

Adverse Effect:

Where do you get the product(s)? Mark all that apply.

- ○ Grocery store (Kroger, Giant Eagle, Meijer, etc.)
- ○ Drugstore (Walgreens, CVS, Drugmart, etc.)
- ○ Health food store (Whole Foods, Trader Joes, Raisin Rack, etc.)
- ○ Supplement store (GNC, Vitamin Shoppe, Complete Nutrition, etc.)
- ○ Internet site
- ○ Other, please specify: _____

How much do you spend on the product(s)?

- ○ Less than $50 per month
- ○ Between $50 and $100 per month
- ○ More than $100 per month

Where did you obtain information about dietary supplements? Mark all that apply.

- ○ Primary physician
- ○ Pharmacist
- ○ Internet
- ○ Friends/family members
- ○ Books, magazines, or TV
- ○ Other, please specify: _____

Have you informed your physician or pharmacist about your dietary supplement use?

- ○ Yes
- ○ No

Does your health insurance coverage include medications that do not require a prescription?

- ○ Yes
- ○ No
- ○ I don't know

Would you consider taking a dietary supplement prescribed to improve wound healing?

- ○ Yes
- ○ No
- ○ Maybe

What would be the primary factor affecting your decision to take a dietary supplement prescribed to improve wound healing? Mark only one answer.

- ○ Cost
- ○ Taste
- ○ Side effects
- ○ Other, please specify: